Modernization of animal products consumption in Hanoi, Northern Vietnam

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Abstract

Global food crisis has played its negative effects on sustainable development. A question has been raised: how could the families in both rural and urban areas struggle against this present global food crisis? This research aims at documenting household food consumption from January to October 2010 by interviewing with and operating a record keeping system of food consumption in 250 households of various income levels living in two different areas of Hanoi, the inner and suburban districts.

There is variety of animal products consumed in each family of both areas. Indeed, pork meat, broiler chickens and freshwater fish were popularly used in all families; and broiler ducks are usually consumed in summer season. Furthermore, in the inner districts, there is a rise in the demand of red meats and aquatic products, particularly beef and seafood products. Home-made foods are still a major source of foods for all family members of most of families, however, families in urban areas tends to have breakfasts and lunches in restaurants.

In rural areas, the soya curd (tofu) and self-made products from broiler chickens, vegetables, and the rice play an important role, occupying from 15% to 30% of food expenditures. In addition, pork meat and freshwater fish are usually bought in village markets. Through incomes of 82% of households are mainly from agricultural production or from between agriculture and off-farm activities, thanks to self-made products in most of households, the rural areas are not considerably influent by the present global food and financial crisis. Nevertheless, in order to achieve sustainable development, it is necessary to equip farmers with sufficient knowledge of practical agricultural production.

Keywords – food consumption, demand of animal products, mixed income, off-farm activities, Hanoi

I. Introduction

The Vietnam is located in Southeast Asia with a high population of 86.2 million of inhabitants. The population density is really high, especially in the Red River Delta and Central Coast with over 1,000 of inhabitants per km^2. Rural population accounts for 70%, agricultural labors accounts for 63% were distributed in 13 million of farm-households (Vu Nang Dung, 2001). The annual growth rate of agricultural value reached 4.6% per year in the period 1990 - 2009. The agricultural structure of Gross Domestic Products (GDP) decreased continuously from 38.74% in 1990 to 20.91% in 2009. High economic growth has increased the income level per capita per year from $ 200 in 1986 to $ 1,000 in 2009 (GSO, 2009). Thanks to self-sufficient food supply, the rural area has not been much impact from the global food crisis in 2007 – 2008 and financial crisis in 2008 – 2009 (Vu Dinh Ton et al. 2010).

The average growth rate of animal products reached 10% in the period of 2000 - 2007. In particular, animal meat production increased 11% with pork, 9.5% with beef, 8.5% with poultry meat before the avian influenza and milk production increased 32% per year. The total value of livestock production reached 97.9 thousand billion of Vietnam dongs (VND) occupying 27% of agricultural GDP (GSO, 2009).

The average income per inhabitant increase was followed the demand of food consumption increased. The total expenditure for food consumption was estimated at $ 3.4 billion in 1992 – 1993. But this expenditure for food consumption has doubled to $ 7.2 billion in 2002 (M. Figuié et N. Bricas, 2003). The level of self-sufficiency with food products in rural area with rice, vegetables, fish, eggs and poultry meat accounted for 36% (Nguyen Duc Truyen, 2003).

The expenditure of food consumption occupies a high proportion in low income households, accounting for 92% of household income (IPSARD - FUSAGx, 2008). Pork consumption accounted for 72% of total meat in households (VLSS/GSO, 2008). And pork consumption per capita per year reached from 14 kg in 1995, 17kg in 2000, 28kg in 2005 and to 34.5 kg in 2009 (Department of Livestock Production, 2010).

This research was conducted to find out the level of poultry meat and animal products consumption in households in Hanoi, in the framework of cooperation between Hanoi University of Agriculture and Unit of Economics and Rural Development, Gembloux Agro-Bio Tech of University of Liège.

II. Methodology

1. Selection of survey sites

The research was conducted on 255 households in both urban and rural areas (155 households in urban and 100 households in rural areas) of Hanoi from January to October 2010.

The urban districts include Cầu Giấy, Ba Đình, Hai Bà Trưng and Long Biên; and rural districts include Phú Xuyên, Chương Mỹ, Gia Lâm and Đông Anh.

2. Research methodology

The research began with the collection of official data concerning the household economic income, average income level and household food consumption in Vietnam and research region from the reports of MARD, General Statistics Office, etc.

There are some direct interviews with local authorities or key persons such as the leaders of communes, villages or annual reports on households' living standards, the main source of household income. Then, households selected based on the diversification of household structure in these zones.

Primary data were collected through direct interview of 300 households in these zones in January and February of 2010. Then, 255 households were chosen and for record keeping of food consumption according to the diversification of households. The food consumption data were recorded weekly during the period from March to October 2010.

3. Data analysis

The collected data is preliminarily treated with Microsoft Excel 2007 and Minitab 16 software. Correlation is established between the income levels and types of food consumed in households based on log-transformed data.

The principal income in the households is calculated by net value-added such as cropping, animal production and off-farm activities or monthly salary of staffs.

Food consumption is kept to the foods mostly used every week including the part of purchase or self-production such as chicken, duck, eggs, beef, pork, fish, tofu, rice, vegetable…

In this research, the demand of food consumption was calculated according to the demand of poultry meat consumption. Then, the demand of other animal products consumption was calculated by the relation of correlation between the meat types of

poultry, beef, pork, fish with the fluctuations of price of these animal products, average income per capita, household size, education level… The demand of poultry meat consumption is calculated by the function follows:

$Q_{Py} = f(P_{Py}, P_B, P_{Pk}, P_F, PDI, A, HH, Edu)$;

Where by:

Q_{Py}: Demand of poultry meat consumption (kg/capita/year)

P: Price of animal products (1,000 Vnd/kg)

PDI: Average income (1,000 Vnd/capita/year)

HH: Household size (inhabitant/household)

Edu: Education level of housewife

A: Area (dummy variable, urban or rural)

Py, B, Pk, F: Meat of poultry, beef, pork and fish or shrimp.

This function is transformed through logarithmic functions follows:

$Log(Y) = \alpha + \alpha_1 Log(X_1) + \alpha_2 Log(X_2) + \alpha_3 Log(X_3) + \alpha_4 Log\ (X_4) + \alpha_5 Log(X_5) + \alpha_6 Log(X_6)$

Y : Demand of poultry meat consumption (kg/capita/year)

α : Constants

X_1 : Retail price of poultry meat (1,000 Vnd/kg)

X_2 : Average income (1,000 Vnd/capita/year)

X_3 : Retail price of pork meat (1,000 Vnd/kg)

X_4 : Retail price of fish and shrimp (1,000 Vnd/kg)

X_5 : Household size (inhabitant/household)

X_6 : Education level of housewife (years at school)

X_7 : Area (dummy variable)

III. Results and Discussion

1. General characteristics and typology of household income

The households surveyed are really diversified according to income level and principal sources of income in each household. Research results are analyzed and compared in the two urban and rural areas. Normally, the wife is in charge of cooking in households so

the housewife is demanded for record keeping of food consumption. The general characteristics and income of households surveyed are presented in Table 1 and Table 2 with some indicators of age of housewife, education level, household size and average income per capita and household.

Table 1: General characteristics of households surveyed

Items	Rural area (n=100)	Urban area (n=155)	All (n=255)
Age of housewife (years old)	45.90[a]	41.23[b]	43.06
Level of education (years at school)	7.66[a]	10.21[b]	9.21
Number of inhabitants/household	4.83[a]	4.23[b]	4.47
Income per inhabitant (1,000 Vnd/year)	19,062[a]	29,062[b]	25,357

Note: Statistical significant difference (P < 0.05) if the values which have different letters in a row

A common characteristic of many households is that two or three generations are living together. There are multiple incomes in the same household. So the total income in household is really diversification. In rural areas, the different incomes come from cultivated crops, animal production and off-farm activities.

In there, typology of household in urban area includes (1a) households with main income from monthly salary, these households are considered as labors higher quality such as medicinal doctors, teachers, officers; (1b) households with main income from commercial services at large scale, business owners; (1c) households with monthly salary income of a lower quality such as workers; and (1d) households with unstable income such as hired workers, small traders. In rural areas, the households were included: (2a) households with monthly salary income or labors with higher quality; (2b) households with main income from commercial activities at large scale; (2c) households with main income from agricultural services, handicrafts; and (2d) households with main income from pure agricultural activities.

Table 2: Comparison of familial income per inhabitant according to typology of income and zone *(1,000 dongs/capita/year)*

1. Urban area	2. Rural area

Month salary with high quality (n=58)	Big traders (n=30)	Month salary with low quality (n=46)	Small traders /others (n=22)	Month salary with high quality (n=11)	Big traders (n=26)	Agri. services, handicrafts (n=39)	Pure agri. farms (n=23)
38,743[a]	35,987[a]	20,377[bc]	14,941[cd]	25,806[abc]	31,190[ab]	17,755[c]	11,148[d]

Note: Statistical significant difference (P < 0.05) if the values which have different letters across a row

The average income per capita per year has reached the highest income in households have a monthly salary income with labors in higher quality (1a; 2a) and the big traders (1b; 2b), reached from 25,806 to 38,743 thousand Vietnam dongs. Otherwise, the lowest income households are the hired workers or small traders in urban areas and pure agricultural activities in rural areas (1d; 2d). Income disparity is significant level or the alpha = 0.05.

2. The expenditures for food consumption in households

Pork products are popular consumed in household in both rural and urban areas, with up to 98% of households. Then, the consumption with fish and shrimp accounts for 97%; poultry meat accounts for 82%; and only 40% of households have consumed beef (VLSS/GSO, 2008).

Households in rural areas have usually three meals per day with all family members. The self-sufficient part of food products such as rice, vegetables, fish, eggs and poultry meat occupied an important proportion. Beef and seafood products have been consumed very few. Pork and freshwater aquatic products are the tendency of food consumption in these areas.

Due to working reason, many households in urban areas have usually the dinner with all family members. The household income is higher than rural areas, so the demand for beef and seafood products is higher.

According to some different researches (Dinh Xuan Tung et al. 2005; Nguyen Thi Thu Huyen et al. 2005; Vu Dinh Ton et al. 2010), the food consumption has large disparity between the rural and urban areas or between the different regions in the country. Pork consumption in Hanoi was about 30.5 kg per capita per year (Nguyen Thi Thu Huyen, 2005). According to Dinh Xuan Tung et al. (2005), food consumption in the rural areas

is lower than urban areas. Pork consumption in the urban areas reached about 20kg per capita per year and about 15 kg per capita per year in rural areas. In there, the rate of pork accounted for 62% of total meat consumed in urban areas and 75% in rural areas. Poultry meat rate accounted for 22% in urban areas and 19% in rural areas. The rate of beef consumption in urban areas is really higher than rural areas (beef meat accounted for 16% of total meat consumed in urban areas compared to 6% in rural areas).

Table 3: Food consumption in households *(kg/capita/year)*

Food products	Rural area (n=100)	Urban area (n=155)	All (n=255)
Pork	22.64[a]	21.75[a]	22.10
Beef	2.96[a]	5.63[b]	4.58
Poultry meat	14.29[a]	14.63[a]	14.50
Fish, shrimp	14.20[a]	21.28[b]	18.50
Lean pork paste	0.67[a]	1.44[b]	1.14
Pork viscera	1.15[a]	1.33[a]	1.26
Total meat, fish, shrimp	55.91[a]	66.05[b]	62.07
Pork bones	4.30[a]	9.23[b]	7.29
Rice	110.29[a]	84.76[b]	94.77
Eggs *(eggs/capita)*	116.52[a]	123.56[a]	120.80

Note: Statistical significant difference (P < 0.05) if the values which have different letters in a row

Thus, the potentiality for animal products consumption in Vietnam's market is even greater. Demand of animal products consumption continuously increases. So, animal production in this country principally aims to supply for domestic demand.

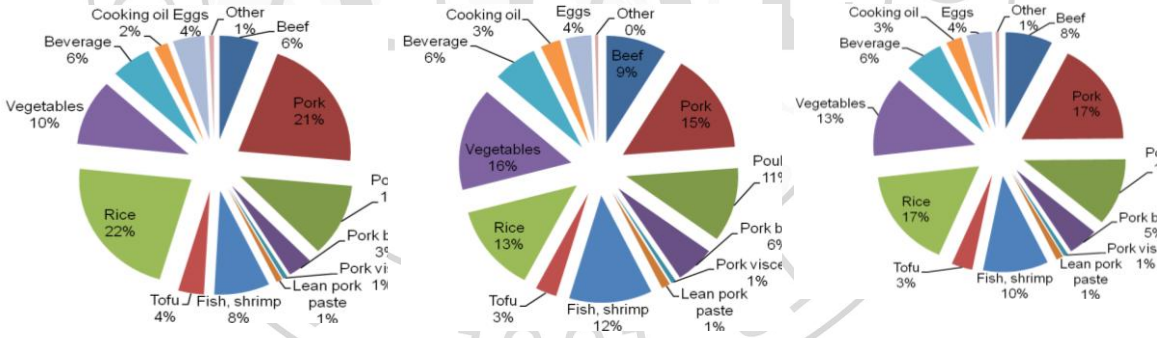
The expenditures of food consumption are different between the urban and rural areas. Expenditure for pork consumption is highest, accounting for 21%; poultry meat accounts for 11%; fish and shrimp accounts for 8% and beef meat accounts for 6% in total expenditures for food consumption in households (Table 4 and Figure 1).

Table 4: Food expenditures per inhabitant per year (1,000 Vnd/capita/year)

Food products	Rural area (n=100)	Urban area (n=155)	All

			(n=255)
Pork	1,066.0[a]	1,173.8[a]	1,131.5
Beef	351.9[a]	715.5[b]	572.9
Poultry	672.7[a]	906.8[b]	815.0
Pork bones	198.6[a]	456.8[b]	355.5
Pork viscera	32.0[a]	50.9[a]	43.5
Lean pork paste	46.4[a]	98.7[b]	78.1
Fish, shrimp	451.0[a]	986.6[b]	776.6
Tofu	175.2[a]	230.6[b]	208.9
Rice	1,058.0[a]	1,013.8[a]	1,031.2
Vegetables	592.1[a]	1,284.7[b]	1,013.1
Beverage	350.6[a]	534.1[b]	462.1
Cooking oil	115.3[a]	224.2[b]	181.5
Eggs	208.0[a]	287.5[b]	256.3
Other	48.3[a]	40.0[a]	43.3
Total	**5,366.1[a]**	**8,004.1[b]**	**6,969.5**

Note: Statistical significant difference (P < 0.05) if the values which have different letters in a row



Rural area Urban area All

Figure 1: Structures of total food products consumed in households

3. Demand of animal products consumption

The meals in households are really diversified with different foods. The animal products consumed are usually pork, chicken, fish, shrimp, eggs, tofu… Therefore, in this research, some principal dependent variables are considered in the demand equation of animal products consumption are the retail prices of pork, poultry meat, beef, fish and

shrimp, average income, household size, education level, rural and urban areas… However, with each different area, these dependent variables have different influences to the demand of poultry consumption and they have different correlation between the types of different food.

3.1 Modelization demand for poultry consumption in urban areas

In the urban areas, two dependent variables have an significant influence to the demand equation of poultry consumption with the retail price of poultry meat and average income. However, the regression coefficient between the demand of poultry consumption with these two variables is very low (R^2 = 9.1%). This shows that at the time of research, the demand of poultry consumption was poorly influenced by the changes of prices of poultry meat and income.

The regression equation is:

Predictor	Coefficient	SE Coefficient	T	P – value
Constant	1.2405	0.4448	2.79	0.006
Log (price of poultry meat)	-0.6423	0.2197	-2.92	0.004
Log (average income)	0.2307	0.0725	3.18	0.002

S = 0.229289 R-Sq = 9.1% R-Sq(adj) = 7.9%

This result shows that the coefficient of elasticity is negative between the demand of poultry consumption and its retail price (-0.6423), and positive between the demand of poultry consumption with the household income (0.2307). Or poultry consumption will decrease 0.64 unit when the retail price of poultry meat increased by 1 unit and poultry consumption will increase to 0.23 unit when household income increased by 1 unit.

In addition, this result shows that the living standards of households in urban areas is higher. The consumption of animal products or poultry meat are affected very few by dependent factors such as the prices of food, household income or other different various variables.

3.2 Modernization of demand for poultry consumption in rural areas

Otherwise, the rural areas, demand of poultry consumption are significantly affected by many dependent variables such as the fluctuation of retail price of poultry meat, retail

prices of pork, fish and shrimp, household income, household size and education level ($P < 0.05$), and the regression coefficient $R^2 = 40.8\%$.

In there, coefficient of elasticity is negative between demand of poultry consumption with retail price of poultry meat (-1.3210), or the demand of poultry consumption will be decreased 1.32 unit when the retail price of poultry meat increased 1 unit. The coefficient of elasticity is positive between the demand of poultry consumption with household income, retail price of fish and shrimp and education level.

The regression equation is:

Predictor	Coefficient	SE Coefficient	T	P – value
Constant	-1.1030	0.8097	-1.36	0.176
Log (price of poultry meat)	-1.3210	0.3327	-3.97	0.000
Log (average income)	0.3081	0.0861	3.58	0.001
Log (price of pork meat)	1.2690	0.4277	2.97	0.004
Log (price of fish, shrimp)	0.4445	0.2310	1.92	0.057
Log (household size)	-0.3648	0.2182	-1.67	0.098
Log (education level)	0.6066	0.2422	2.50	0.014

S = 0.289282 R-Sq = 40.8% R-Sq(adj) = 37.0%

3.3 Correlations on animal products consumption

After calculating the demand of poultry consumption, we consider the relation of correlation between some animal products for better understanding the relationship between the demand of animal products consumption in households such as pork, beef, poultry meat, fish and shrimp and the dependent variables of retail prices of these animal products, household income, household size, education level, results are presented in Table 5.

- ***In urban areas***

The demand of poultry consumption has a low coefficient correlation with the prices poultry meat, fish and shrimp, and household income, household size ($P < 0.05$). The demand of poultry consumption has not significant correlation ($P > 0.05$) with the variables on prices of beef, pork and education level.

The demand of beef consumption has a higher significant correlation with the prices of beef, fish and shrimp ($P < 0.05$). But this demand has low significant correlation with prices of poultry meat, pork and household income. And this demand has not significant correlation with housewife's education level ($P > 0.05$).

The demand of pork consumption has a significant negative correlation at average with the price of pork meat and household size ($P < 0.05$). This demand has a weak negative correlation with the prices of beef, poultry meat and fish ($P < 0.05$). The demand of pork consumption has not significant correlation with household income and education level ($P > 0.05$). Therefore, pork meat is an indispensable and it is mainly consumed in households.

The demand of fish and shrimp consumption has a weak positive correlation with price of pork, household income, education level; a weak negative correlation with household size ($P < 0.05$). So, this result shows that the fish and shrimp products are the animal food products which could be replaced for pork meat.

Table 5: Correlation between the demand of animal products consumption with their retail prices, education level, household income and household size

	Urban				Rural			
	Poultry	Beef	Pork	Fish	Poultry	Beef	Pork	Fish
Price of poultry	-0.173 (0.031)	0.261 (0.001)	-0.195 (0.015)	-0.030 (0.707)	-0.194 (0.053)	0.105 (0.299)	-0.061 (0.546)	0.147 (0.144)
Price of beef	-0.057 (0.483)	0.596 (0.000)	-0.325 (0.000)	-0.118 (0.142)	0.305 (0.002)	0.487 (0.000)	0.082 (0.418)	0.151 (0.133)
Price of pork	0.010 (0.900)	0.244 (0.005)	-0.404 (0.000)	0.189 (0.018)	0.367 (0.000)	0.507 (0.000)	0.134 (0.182)	0.255 (0.010)
Price of fish	0.266 (0.001)	0.498 (0.000)	-0.244 (0.000)	-0.092 (0.254)	0.302 (0.002)	0.423 (0.000)	-0.160 (0.111)	0.150 (0.137)
Education	0.067 (0.409)	-0.041 (0.616)	0.085 (0.294)	0.169 (0.036)	0.209 (0.037)	0.165 (0.101)	0.041 (0.687)	-0.004 (0.966)
Income	0.199 (0.013)	0.322 (0.000)	-0.070 (0.390)	0.170 (0.035)	0.468 (0.000)	0.389 (0.000)	0.148 (0.142)	0.306 (0.002)
Inhabitant	-0.328 (0.000)	0.161 (0.045)	-0.352 (0.000)	-0.179 (0.026)	-0.028 (0.784)	0.006 (0.950)	-0.146 (0.146)	-0.260 (0.009)

(values in parentheses are P_{value} probabilities of the significance test of the correlation).

- ***In rural areas***

The demand of poultry consumption has a weak negative correlation with price of poultry meat, but it has a high significant positive correlation with retail prices of beef, pork, fish and shrimp, household income and education level ($P < 0.05$). Therefore, the rural consumers will inscreasly consume the poultry meat when the prices of poultry meat has decreased, and the average income increased or when the prices of beef and pork will increase. However, the demand of poultry consumption has not a significant negative correlation with household size ($P > 0.05$).

The demand of beef consumption has a high significant positive correlation with the retail prices of beef, pork, fish and shrimp, and household income ($P < 0.05$). The demand of beef consumption has not significant positive correlation with household size ($P > 0.05$). This result shows that beef consumption is still limited or the beef meat is considered a luxury product and the consumers usually buy a quantity very few per time.

It is similar with the urban areas, the demand of pork consumption has not significant correlation with the prices of pork, poultry meat, beef ($P > 0.05$). In fact, in the time of research, the fluctuation of pork price has changed very few and pork meat is considered as a daily food consumption.

The demand of fish and shrimp consumption has a weak positive correlation with the price of pork, household income and it has a weak negative correlation with the household size ($P < 0.05$). The consumption of fish and shrimp has not significant ($P > 0.05$) with the fluctuation of prices of poultry meat, beef, fish and shrimp, and housewife's education level. This result shows again that the freshwater aquatic products are the lower price foods in compared with the prices of beef, poultry meat. The fish and shrimp are not the animal products which could be replaced for beef, poultry meat but fish and shrimp are the animal products which could be mainly replaced for pork meat.

IV. Conclusions

The consumption of food and animal products are really diversified in both rural and urban areas. The demand of animal products consumption is increasing, particularly with pork, poultry meat and freshwater aquatic products caused by the the household income and the population size have increased continously in recent years.

The average income per capita reached 29,442 thousand VND in urban areas, and 20,729 thousand dongs in rural areas. In rural areas, 82% of households have an income concerning to agricultural activities. In there, a high disparity on household income is about 4 times between the group of highest household income in urban areas and the household group of pure agricultural production in rural areas.

The average consumption on animal products are 66.05 kg/capita/year in urban areas and 55.91 kg/capita/year in rural areas. The animal products are mainly consumed pork and freshwater fish but poultry meat and fish are usually self-sufficient in rural areas. The rate of animal products consumption are 36% with pork, 23% with poultry meat, 7% with beef and 30% with fish and shrimp. Otherwise, the household income is higher in urban areas, therefore the consumption of red meats and seafood is increasing at 5.63kg per capita per year compared with 2.96kg per capita per year in rural areas.

The demand of poultry consumption is poorly explained by selected economical variables in urban areas (R^2 = 9.1%), but the relation is much stronger in rural areas (R^2 = 40.1%).

There are low correlations between the fluctuation of price of poultry meat and prices of beef, pork, aquatic products and household income, education level of housewife ($P < 0.05$). The level of living standards is really higher in urban areas and the fluctuation of prices is not significant in the during of research, so the households in urban areas are affected very few to the choice of food consumption.

Otherwise, there are higher correlation between the price of poultry meat with the prices of pork, beef, fish and shrimp and household income, housewife's education level ($P < 0.05$).

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